REMARKS/ARGUMENTS

Status of the Claims

Claim 62 has been amended, for reasons discussed below, to replace "altered" with --decreased-- in the clause that follows part e).

Claim 87 has been amended to correct an inadvertent typographical error that was pointed out in the Office Action. The claim has been amended to replace the semicolon at the end of the claim with a period.

No new matter has been added by way of amendment to the claims.

Claims 62-79 and 87-94 are pending.

Reexamination and reconsideration of the application as amended are respectfully requested in view of the following remarks. The Examiner is respectfully requested to withdraw the rejections to claims 62-79 and 87-94 and to allow these claims. In any event, the Examiner is respectfully requested to enter the above amendments for the purpose of furthering prosecution.

The Rejections of the Claims under 35 U.S.C. § 112, First Paragraph, Should Be Withdrawn

Claims 62-66 have been rejected under 35 U.S.C. § 112, first paragraph, for lack of enablement. Claim 62 has been amended. This rejection is respectfully traversed.

The Office Action indicates that the specification is enabled for a method of decreasing the number of disulfide bonds of storage proteins in a plant or part thereof comprising transforming a plant with a nucleotide sequence comprising SEQ ID NO: 24 encoding a NADPH-thioredoxin reductase of SEQ ID NO: 25, or a nucleotide sequence having at least 95% sequence identity to the coding sequence of the nucleotide sequence set forth in SEQ ID NO: 24, wherein said nucleotide sequence encodes a polypeptide comprising NADPH-thioredoxin reductase activity, or a nucleotide sequence that hybridizes to the complement of the nucleotide sequence of SEQ ID NO: 24 under the conditions specified in claim 62(d) and wherein said

nucleotide sequence encodes a polypeptide comprising NADPH-thioredoxin reductase activity; transforming said plant with a second nucleotide sequence encoding a thioredoxin *h* polypeptide wherein the expression of both nucleotide sequences in grains chemically reduces the disulfide bonds of storage proteins.

The Office Action asserts, however, that the specification does not provide reasonable enablement for claims drawn to a method for altering the disulfide status of storage proteins in a plant or part thereof, which reads on increasing the number of disulfide bonds in a plant or part thereof, comprising transforming a plant the first and second nucleotide sequence described above. The Office Action concludes the specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In support of this position, the Office Action cites *In re Wands* 8 U.S.P.Q. 2d 1400 (Fed. Cir. 1988).

The Office Action further asserts that claim 62 reads on both increasing and decreasing the disulfide status of storage proteins in a plant or part thereof and that Applicants have only exemplified decreasing the disulfide status of storage proteins by overexpressing a thioredoxin *h* polypeptide but have not exemplified increasing the disulfide status of storage proteins by reducing the activity of the endogenous thioredoxin *h*. The Office Action also asserts that Applicants have not disclosed that inhibiting the endogenous activity of NADPH-thioredoxin reductase or thioredoxin *h* will increase the disulfide status of storage proteins in plants.

The Examiner appears to be applying a standard with respect to the enablement requirement of 35 U.S.C. § 112, first paragraph, that is inconsistent with the case law that was discussed in Applicants' previous response to the Office and is not repeated here for the sake of brevity. Furthermore, in contrast to the view of the Office Action, Applicants disclose that their claimed invention includes, but is not limited to, methods for altering the disulfide status of storage proteins including increasing and decreasing the disulfide status of storage proteins. Applicants have further disclosed in Example 11 (pp. 51-56) of the instant specification that that their claimed methods can be used to alter the disulfide status of storage proteins in maize kernels as is evidenced by increased digestibility in *in vitro* assays. Applicants provide not only

the exemplified nucleotide sequences set forth in SEQ ID NOS: 24 and 13, but also sufficient guidance for one of ordinary skill in the art to make and use the invention as claimed in any plant, including methods that involve antisense suppression and/or cosuppression. While antisense suppression and cosuppression methods are known to those of ordinary skill in the art, the specification provides additional guidance on pages 39 and 40, including the teachings of U.S. Patent Nos. 5,283,184 and 5,034,323, which have been incorporated by reference into the specification. Thus, in contrast to the conclusion of the Office Action, the claims are enabled for increasing the number of disulfide bonds by utilizing antisense and cosuppression technology.

In the interest of furthering prosecution of the instant application and not to limit the scope of their claimed invention, Applicants have amended claim 62 to recite that the disulfide status of the storage proteins is decreased in the plant or part thereof. Applicants expressly reserve the right to file one or more continuing applications directed to the subject matter that is excluded from claim 62 and its dependent claims by this amendment.

In view of the amendment and above remarks, it is submitted that the rejection of claims 62-66 under 35 U.S.C. § 112, first paragraph, should be withdrawn.

The Rejection of the Claims under 35 U.S.C. § 102(a) Should Be Withdrawn

Claims 62-79 and 87-94 have been rejected under 35 U.S.C. § 102(a) as being anticipated by Lanahan (June 2000 WO 00/36126). Claims 62 and 87 have been amended. This rejection is respectfully traversed.

The Office Action indicates that WO 00/36126 teaches a method of reducing disulfide bonds in seed proteins and a plant comprising transforming corn or soybeans with nucleic acids encoding thioredoxin and thioredoxin reductase operably linked to a promoter and a plant comprising said sequences. The Office Action fails, however, to recognize that WO 00/36126 does not disclose even one nucleotide sequence encoding a thioredoxin or a thioredoxin reductase. The Office Action, nevertheless, asserts that the stated hybridization conditions are

sufficient to permit hybridization between Applicants' sequences and the sequences of WO 00/36126.

Applicants respectfully disagree with the position of the Office Action that the stated hybridization conditions are sufficient to permit hybridization between Applicants' sequences and the sequences of WO 00/36126. The claims of the instant application are directed to methods and transformed plants comprising a nucleotide construct that comprises a nucleotide sequence encoding a thioredoxin *h* and a nucleotide construct comprising a nucleotide sequence encoding a NADPH-thioredoxin reductase, wherein the nucleotide sequence encoding a NADPH-thioredoxin reductase is selected from the group consisting of: SEQ ID NO: 24; fragments and variants that have at least 95% sequence identity to the coding sequence of SEQ ID NO: 24 and that encode a polypeptide comprising NADPH-thioredoxin reductase activity; and fragments and variants that hybridize the complement of the nucleotide sequence set forth in SEQ ID NO: 24 under stringent conditions comprising hybridization at 37°C in a solution comprising in 50% formamide, 1 M NaCl, and 1% SDS, and at least one wash at 60°C in a solution comprising 0.1X SSC and that encode a polypeptide comprising NADPH-thioredoxin reductase activity. Dependent claims 63, 68, 74, and 88 additionally recite that the nucleotide sequence encoding a thioredoxin *h* is selected from the group consisting of: SEQ ID NO: 13; fragments and variants that have at least 95% sequence identity to the coding sequence of SEQ ID NO: 13 and that encode a polypeptide comprising thioredoxin *h* activity; and fragments and variants that hybridize the complement of the nucleotide sequence set forth in SEQ ID NO: 13 under stringent conditions comprising hybridization at 37°C in a solution comprising in 50% formamide, 1 M NaCl, and 1% SDS, and at least one wash at 60°C in a solution comprising 0.1X SSC and that encode a polypeptide comprising thioredoxin *h* activity. Given that WO 00/36126 fails to disclose a nucleotide sequence encoding a thioredoxin reductase or a thioredoxin, WO 00/36126 does not anticipate Applicants' claimed invention.

The Office Action indicates on page 8 that the "Office interprets 'thioredoxin h' and 'thioredoxin' to be the same enzymes and have the same activity." Applicants note that WO 00/36126 discloses amino acid sequences of thermostable thioredoxins and thioredoxin

reductases from the hyperthermophilic organisms, *Archaeoglobus fulgidus* and *Methanococcus jannaschii*. Applicants further note that these archaebacteria or archaeons are not known to be closely related to eukaryotes, particularly plants, more particularly cereal plants. Given the very distant phyllogenetic relationship between these archaeons and cereal plants like *Zea mays*, the amino acid sequences of the archaebacterial thioredoxins and thioredoxin reductases disclosed in WO 00/36126 are not expected to be very similar to the respective cereal thioredoxin and thioredoxin reductase amino acid sequences disclosed in the present application. In fact, the amino acid sequence of the *Zea mays* NADPH-thioredoxin reductase set forth in SEQ ID NO: 25 of the present invention (*i.e.*, the amino acid sequence encoded by SEQ ID NO: 24) shares only 27% and 32% amino acid sequence identity with the amino acid sequences of *Methanococcus jannaschii* and *Archaeoglobus fulgidus* thioredoxin reductases, respectively, that are disclosed in WO 00/36126. Similarly, the amino acid sequence of the *Zea mays* thioredoxin *h* sequence set forth in SEQ ID NO: 14 of the present invention (*i.e.*, the amino acid sequence encoded by SEQ ID NO: 13) shares only 27% amino acid sequence identity with the amino acid sequence of the *Methanococcus jannaschii* thioredoxin that is disclosed in WO 00/36126 and only 14%, 20%, 28%, and 34% with the amino acid sequences for the four *Archaeoglobus fulgidus* thioredoxins of WO 00/36126 that are designated therein as trx-1, trx-2, trx-3, and trx-4, respectively.

The Office Action asserts that because Applicants' methods and plants all comprise the same starting material and method steps and that the methods of WO 00/36126 and comprise the same starting material and method steps, the methods of WO 00/36126 would also improve digestibility and processing of grains, and as such, anticipate the claimed invention. However, WO 00/36126 does not disclose a nucleotide sequence encoding a thioredoxin reductase, particularly the nucleotide sequence set forth in SEQ ID NO: 24 and the fragments and variants thereof that are described in detail above. Furthermore, WO 00/36126 does not disclose a nucleotide sequence encoding a thioredoxin, particularly the nucleotide sequence set forth in SEQ ID NO: 13 and the fragments and variants thereof that are also described in detail above. Accordingly, WO 00/36126 does not anticipate Applicants' claimed invention.

In view of the remarks, it is submitted that the rejection of the claims under 35 U.S.C. § 102(a) should be withdrawn.

The Finality of the Office Action Is Improper

The Office Action mailed December 29, 2004 has been made final. The Office Action indicates on page 9 that the Office Action was made final because "[a]pplicant's amendment necessitated the new ground(s) of rejection presented in this Office action." The Office Action fails, however, to indicate how Applicants' amendment necessitated the new ground(s) of rejection.

Applicants do not disagree that the Office Action presents a new ground for rejection. In the Office Action, claims 62-79 and 87-94 were rejected for the first time under 35 U.S.C. § 102(a) as being anticipated by Lanahan (WO 00/36126).

Applicants do, however, respectfully disagree with the position of the Office Action that Applicants' amendment necessitated this new ground for rejection. The Examiner is reminded that in the previous Office Action (mailed June 30, 2004), the claims were rejected under 35 U.S.C. § 102(e) as being anticipated by Lanahan (WO 00/36126). In their last response to the Office, Applicants provided a proper and complete response to the rejection of the claims under 35 U.S.C. § 102(e) by indicating that WO 00/36126 could not legally be the basis for a rejection of the claims of the present application under 35 U.S.C. § 102(e). On page 9 of the Office Action mailed December 29, 2004, the Examiner acknowledged the correctness of Applicant's position regarding the rejection of the claims under 35 U.S.C. § 102(e) and "changed this rejection to a 102(a) rejection based on the publication date of the WO 00/36126 document." The Examiner did not indicate that this statement of a new ground for rejection was necessitated by Applicants' amendment.

In their last response to the Office, Applicants amended the claims in response to claim rejections under 35 U.S.C. § 112, first paragraph. It, however, remains unclear to Applicants how such claim amendments necessitated the new ground for rejection under 35 U.S.C. § 102(a)

in the instant Office Action. The Examiner is respectfully invited to set forth with particularity how Applicants' amendment necessitated the new ground for rejection or withdraw the finality of the instant Office Action.

In view of the above remarks, Applicants respectfully request that Examiner either withdraw the finality of the instant Office Action and issue a new, non-final Office Action or issue a Notice of Allowance.

CONCLUSIONS

In view of the above amendments and remarks, Applicants submit that the rejections of the claims under 35 U.S.C. §§ 102 and 112 are overcome. Applicants respectfully submit that this application is now in condition for allowance. Early notice to this effect is solicited. In any event, the Examiner is respectfully requested to enter the above amendments for the purpose of furthering prosecution.

If in the opinion of the Examiner a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 C.F.R. § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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Appl. No.: 10/005,429
Amdt. dated March 25, 2005
Reply to Office Action of December 29, 2004

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CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that this paper is being facsimile transmitted to the U.S. Patent and Trademark Office Fax No. (703) 872- 9306 on the date shown below.

Karyn Gramm — March 25, 2005
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